Laboratory prevents runway collisions with 20-to-25 year old sensor technology

by Fran Crumb, Information Directorate

ROME, N.Y. — At a time when airline passengers may face as much danger on the ground as in the air, Air Force-funded research has demonstrated that decades-old highway monitoring technology can enhance safety at the nation's airports.

Engineers at the Air Force Research Laboratory Information Directorate in Rome have extended simple traffic-light sensors to perform advanced ground vehicle safety protection. The technology is the result of a $1.3 million contract with ORINCON Corp. of San Diego, Calif., to demonstrate the use of inductive loop sensors as an affordable and reliable ground surveillance and tracking system for airfields.

ORICON's Ground Safety Tracking and Reporting System (GSTARS) was successfully demonstrated last month at MacDill AFB, Fla. During simulation of a potentially disastrous runway collision — in which one aircraft pulls into the path of another cleared for takeoff — sensors in the runway picked up identification, location, speed and direction information, then fed it to a central computer in the air traffic control tower. The GSTARS computer recognized the potential for a collision and warned air traffic controllers.

"Loop sensors have been around for about 20 to 25 years, and they're used to count vehicles for traffic light control," said Richard R. Gassner, program manager in the directorate's Information and Intelligence Exploitation Division. "GSTARS makes use of the same basic technology used to detect, count and identify vehicles on highways to provide detailed information about aircraft and vehicles on runways."

In addition to the increased volume of aircraft on runways and taxiways, a variety of service vehicles are also commuting around terminals and tarmac – a congested situation only partially addressed by existing ground radar facilities located at very high volume airports.

GSTARS can detect, characterize and track aircraft, fuel trucks, and other ground vehicles on runways and taxiways in all weather conditions. When the sensor data is fused together, the system identifies the potential for collisions and alerts the control tower in time to prevent mishaps. The system can also enhance security by recognizing unauthorized vehicles.

"At large airports, where ground radar is in operation or being installed, GSTARS can augment that radar by eliminating blind spots and clarifying ambiguous readings that occur through multi-path interference," Gassner said. "At small airports that can't afford ground radar, the system can function autonomously to provide an effective ground safety system."

Combining standard inductive loop sensors with ORICON's signal processing and neural network technologies allows GSTARS to classify a vehicle in one of more than 20 different categories — as well as accurately estimate vehicle speed and length. The system can be installed for about one-tenth the cost of an existing ground radar system and offers additional savings in maintenance.

"Since the amount of metal and the magnetic signature differs for all aircraft types and ground vehicles, this system can increase security by recognizing unknown vehicles on the runway," Gassner said. "It could be especially valuable in situations where a controller cannot visibly monitor the runway due to obstructions, poor weather conditions or darkness. It may also assist controllers who are responsible for monitoring activity at 'uncontrolled' airstrips that may be several miles away from the control tower." @